

TUGUO TATEOKA*: Notes on *Anthoxanthum nipponicum* Honda

館岡亜緒*: ミヤマハルガヤについて

Anthoxanthum nipponicum was described in 1926 by Honda on the basis of a specimen collected at Mt. Akaishi, Central Japan. Subsequent botanical explorations have disclosed that this taxon occurs in alpine belts of various mountains of the Akaishi Range, Rishiri Is., Mt. Hotai in Korea, and Manchuria. Nevertheless, the habitat of this taxon is still quite limited and is strictly alpine in Japan. *A. nipponicum* is apparently a close relative of *A. odoratum* L., which is native to Europe and has been introduced to various temperate and warm-temperate regions of the World. *A. odoratum* was introduced to Japan about 80 years ago, and now abundantly occurs in lowland areas of this country.

Since Östergren (1942) found both diploid ($2n=10$) and tetraploid ($2n=20$) plants in *A. odoratum* sensu lato, various authors have discussed their evolutionary relationships and taxonomy. Löve and Löve (1948) created a new species, *Anthoxanthum alpinum* L. et L., for the diploid form, the tetraploid form being ascribed to *A. odoratum* s. str. This taxonomic treatment has been accepted as satisfactory by Tutin (1950), Knaben (1950), Rozmus (1958, 1960) and Borrill (1963). On the other hand, Hedberg (1961) seems to be unconvinced in recognizing *A. alpinum* as an independent species: her investigations on herbarium material have shown that the morphological distinctions between *A. alpinum* and *A. odoratum* claimed by earlier authors are actually untenable. Böcher (1961, and in Böcher, Holmen and Jakobsen 1957) has also preferred to treat the diploid form as *A. odoratum* ssp. *alpinum*. Recently, Jones (1964) investigated the *A. odoratum* complex from cytological and evolutionary viewpoints and reported various important findings. In contrast to the opinion of some earlier authors that *A. odoratum* may be an autotetraploid of *A. alpinum*, Jones (l.c.) found a marked difference in karyotype between these two species. Furthermore, Jones (l.c.) uncovered the fact that *A. odoratum* has an extraordinary degree of interplant variation in chromosome behaviour. Böcher (1961), Borrill (1963) and Jones (1964) are of the opinion that *A. odoratum* could have been brought out through hybridization of *A. alpinum* and some Mediterranean diploid taxa.

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Upon reading these papers, it was noticed that *A. nipponicum* is closer to *A. alpinum* than to *A. odoratum* in morphology and ecology. Both *A. nipponicum* and *A. alpinum* occur in mountains or in high latitude areas, while *A. odoratum* is generally found in lowlands or more southern areas. In view of the results of the investigations by Hedberg (1961) and Böcher (1961), it seems quite difficult to find clear-cut morphological distinction between *A. alpinum* and *A. odoratum* when a large number of populations are taken into account. The same is true of the relation between *A. odoratum* and *A. nipponicum*. The latter has, however, glabrous pedicels and glumes, and is generally narrower in leaf breadth and shorter in inflorescence length (Fig. 1). According to Tutin (1950), *A. alpinum* from Switzerland is morphologically similar to *A. nipponicum*. Rozmus (1958) stated that *A. alpinum* in Poland has the sterile lemmas of which the upper one-third is not hairy, while the sterile lemmas of *A. odoratum* are hairy throughout. *A. nipponicum* is identical with *A. alpinum* in Poland in this character.



Fig. 1. *Anthoxanthum nipponicum* Honda.

In the summer of 1965, I collected a few clones of *A. nipponicum* at Mt. Sanpuku in the Akaishi Range. Root tips were also collected for cytological studies (Voucher specimen, Tateoka 5019). Slides were made according to the usual paraffin method, as the only root tips available has been fixed directly in the field without any pre-treatment.

Fig. 2 shows the somatic chromosomes of *A. nipponicum*. It is evident that this taxon is diploid with $2n=10$ chromosomes and its karyotype consists of one pair of Sat-chromosomes, three pairs of sub-medians and a pair of small medians. The Sat-chromosomes have a large satellite and the primary

constriction which divides the entire chromosome into two segments of about equal size. When the karyotype morphology of *A. nipponicum* as described above is compared with that of *A. alpinum* appearing in Jones' (1964) drawings and descriptions, a remarkable resemblance is recognized. These two species have in common the chromosome complement composed of one pair of Sat-chromosomes, three of sub-medians and one of small medians. Jones (1964) also investigated the karyotypes of a few Mediterranean diploid species, such as *A. aristatum* and *A. ovatum*, as well as of various populations of *A. odoratum*. Their karyotypes differ significantly from those of *A. nipponicum* and *A. alpinum*.

From the above descriptions, it may be seen that *A. alpinum* and *A. nipponicum* are so close that they could represent one and the same species. It seems desirable, however, to explore further the evolutionary history of the *A. odoratum* complex before a definite taxonomic rearrangement is put forward. Various diploid taxa of this complex are known from the Mediterranean region, and further studies on their relationships to *A. alpinum*, *A. nipponicum* and *A. odoratum* seem to be of interest.

A. alpinum is known to occur in Greenland, Iceland, the Alps, Polish mountains, Transylvania and Scandinavia. In addition, Zvelev et al. (1964) recently designates many sites of this species in the northern parts of West and Central Siberia. The present work has indicated that a taxon closely related to or even conspecific with *A. alpinum* is distributed in the Far East. The range of the diploid form *alpinum* — *nipponicum* thus extends from Greenland to Central Japan via Europe and Siberia.

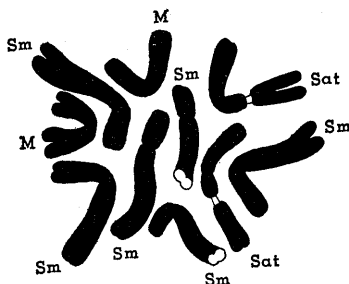


Fig. 2. Somatic chromosomes of *Anthoxanthum nipponicum* Honda. X. 3300.

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ミヤマハルガヤ (*Anthoxanthum nipponicum* Honda) は 1926 年に本田博士により記載されたが、ハルガヤ (*A. odoratum* L.) と形態的に多分に似ているので、ハルガヤの 1 変種として扱われることもある。これらの相互関係についてはこれまで特にみるべき研究はなされていなかった。

欧州において近年ハルガヤとその近縁種についての細胞遺伝学的または種分化の観点からの研究が進んでいるが、その成果の一部として、従来ハルガヤとしてまとめられて

いたもののなかに 2 倍体 ($2n=10$) と 4 倍体 ($2n=20$) があり、4 倍体を狭意のハルガヤ (*A. odoratum* L.) とし、2 倍体は独立の種 *A. alpinum* Löve & Löve として扱われるべきものであることが判明している。ハルガヤと *A. alpinum* とは核型において明確に異なり、ハルガヤを *A. alpinum* の同質 4 倍体とみなすことはできない。

ミヤマハルガヤは外部形態と生態において 4 倍体のハルガヤより 2 倍体の *A. alpinum* により近い。この関係を染色体の上から検討しようと思ひ、三伏峠 (南アルプス) において採集したミヤマハルガヤについて染色体を観察した。その結果、ミヤマハルガヤは 2 倍体 ($2n=10$) であること、また核型においてミヤマハルガヤと *A. alpinum* はきわめて類似していることが判明した。ミヤマハルガヤ～*A. alpinum* はおそらく同一の種類として扱われるべきものと思われる。しかし、なお命名上の変更を与えうるところまでハルガヤ複合体の分化の状態が解明されていないので、いまのところミヤマハルガヤは独立の種 *A. nipponicum* Honda として扱っておくのがよいと思われる。

ミヤマハルガヤは赤石山系、利尻島、朝鮮、満州に知られており、*A. alpinum* はグリーンランド、欧州中部・北部、シベリアから報告されている。他にこれらに似た 2 倍体のいくつかの種類があるが、それらはスペイン、コルシカなどの地中海地方各地に局在的に分布している。このような 2 倍体レベルでの分化の時期は明らかでないが、それらが地中海地方から日本にまで分布を広げたのは事実である。一方、4 倍体であるハルガヤは、2 倍体レベルでの分化より一段あつて欧州において生まれたもので、分布は連続的で生活力も強い。人類の媒介がなくても分布を拡大する強い力をもつものであることは疑いない。本邦において、2 倍体レベルでの産物としてのミヤマハルガヤが大巾に減少し、かわつて 4 倍体であるハルガヤが侵入してきているわけである。

おわりにミヤマハルガヤの採集のために便宜を与えられた長野県下伊那の浅野一男氏に深く感謝します。

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